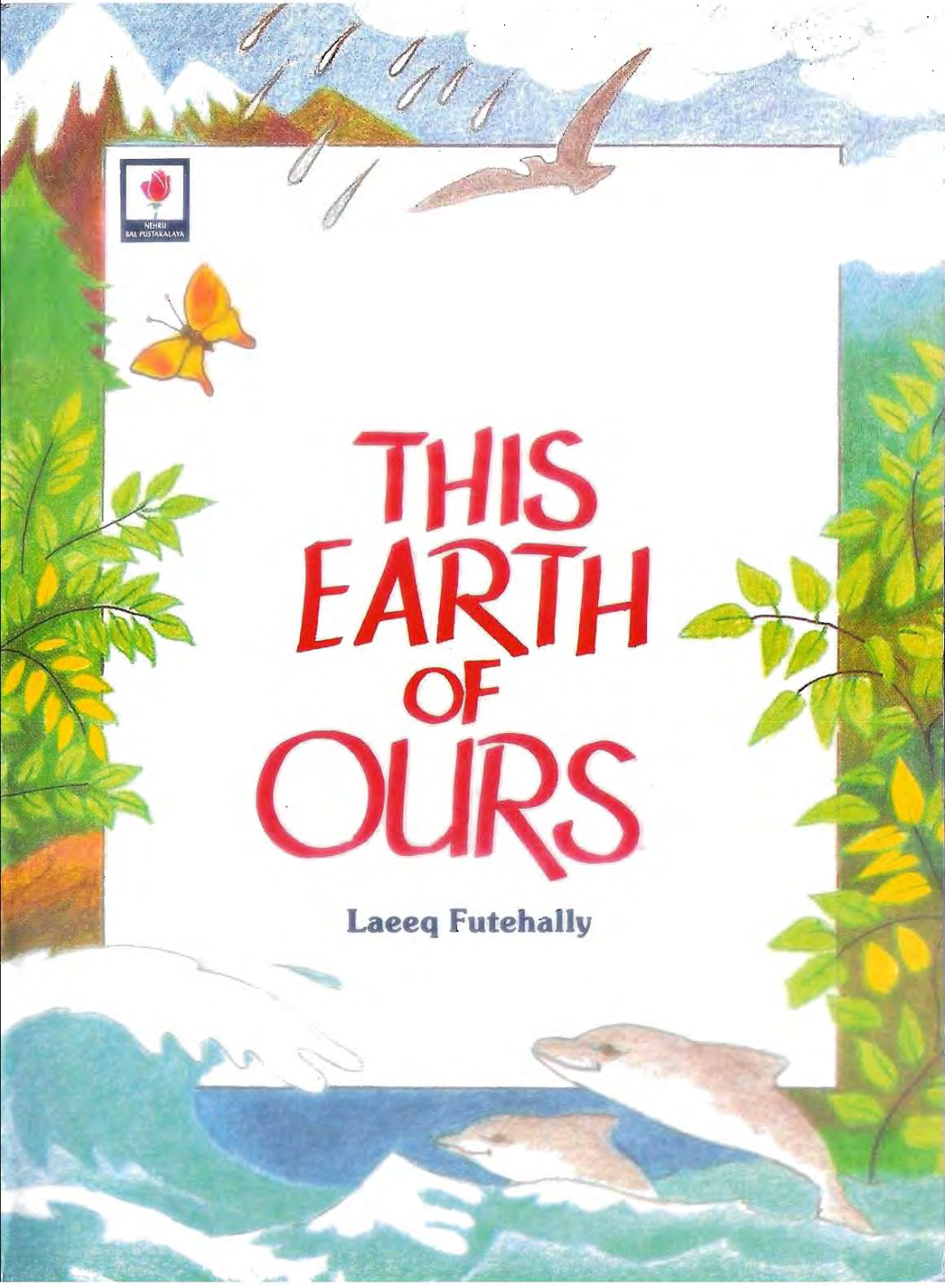
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THIS EARTH OF OURS
Laeeq Futehally

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THIS EARTH OF OURS

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Next time you are watching the rain, try and play a game with yourself. Ask yourself as many questions as you can about the rain.

Is it a heavy rain or a light one?

Are the drops of water big or small?

Do they come down fast or slow?

Is there a lot of space between the drops or are they so close that it feels like a solid sheet of water?

Is the rain falling straight or is there a wind which makes it come slanting at a sharp angle?

Again, is it just a single shower, or is it part of the kind of weather which may last several days?

Do you think it is raining over a large area or only a small patch?

What does the sky look like?

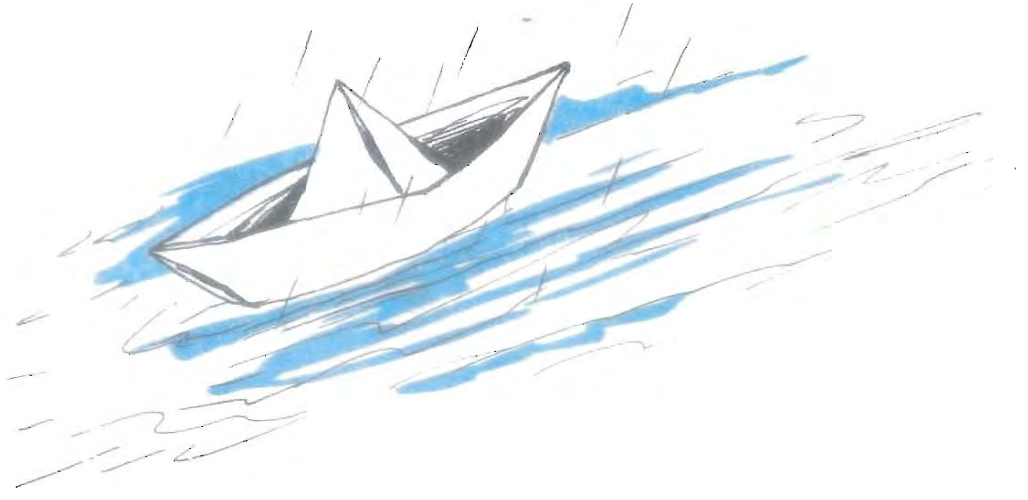
Can you guess from its colour and from the shape and colour of the clouds how long it will rain?

Next, imagine to yourself all the different surfaces on which the raindrops are falling, and try to think of the different things which will happen to the water which falls on the different places. Right in front of you, perhaps, there is a road paved with either asphalt or cement. The rain falls on it and makes a wet patch; presently the sun comes out and the patch dries up, which means that the particles of water have become non-water and have been absorbed into the atmosphere. A little way off from where you are, may be a patch of grass. When the rain falls on it, you cannot see the water sitting there as it sat on the cement. It immediately sinks into the earth and starts flowing in tiny driblets through the soil until it joins a bigger underground stream.

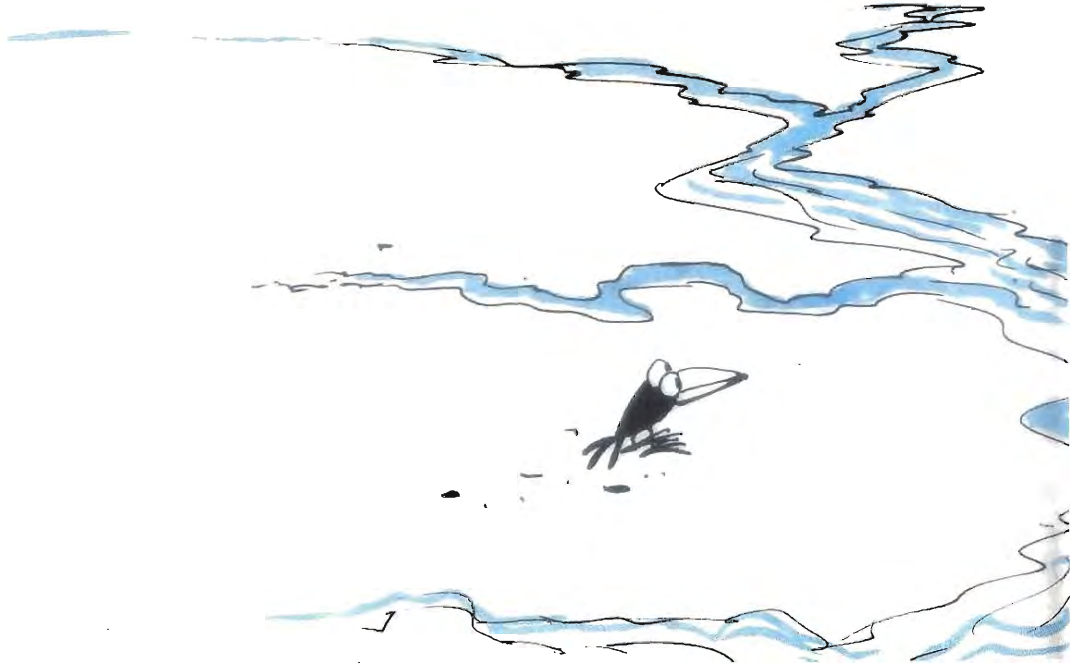
Supposing your rain is falling on a bare patch of earth—with neither grass nor cement. Then where will the water go? Well, much will depend on what kind of soil it is. If the soil is loose and sandy, the water will sink in very fast, there will be no chance of a

puddle. If the soil is sticky or clayey (like plasticene) then the water will collect and stand about in puddles. It will sink into the earth very slowly, and while it is soaking in, it may stop raining, in which case some of the puddles may evaporate and, like our first drops, become part of the atmosphere. These kinds of puddles, where the rain falls on bare land and makes it muddy are the most familiar to us. We are used to seeing muddy roads, and dodging about trying to find a dry spot to put our feet.

We are also familiar with sloping roads where rain water flows downhill, making little streams. Sometimes there is a gutter by the side of the road, so that the water can flow into it, without damaging the surface of the road. You will notice that, in such cases, the flowing water is always a dark brown muddy colour. Why should this be so? Rain water itself is absolutely clean and pure but the minute it reaches the land and starts to flow. it



becomes brown and dirty. Well, of course, it looks brown because some of the soil has joined the water. If the water is flowing fast, which means that the slope is rather steep, then it will pick up a great deal of soil on its way; while if it is flowing slowly, it will pick up less soil. But either way, the land, or road over which our water is flowing will lose that much of its soil.

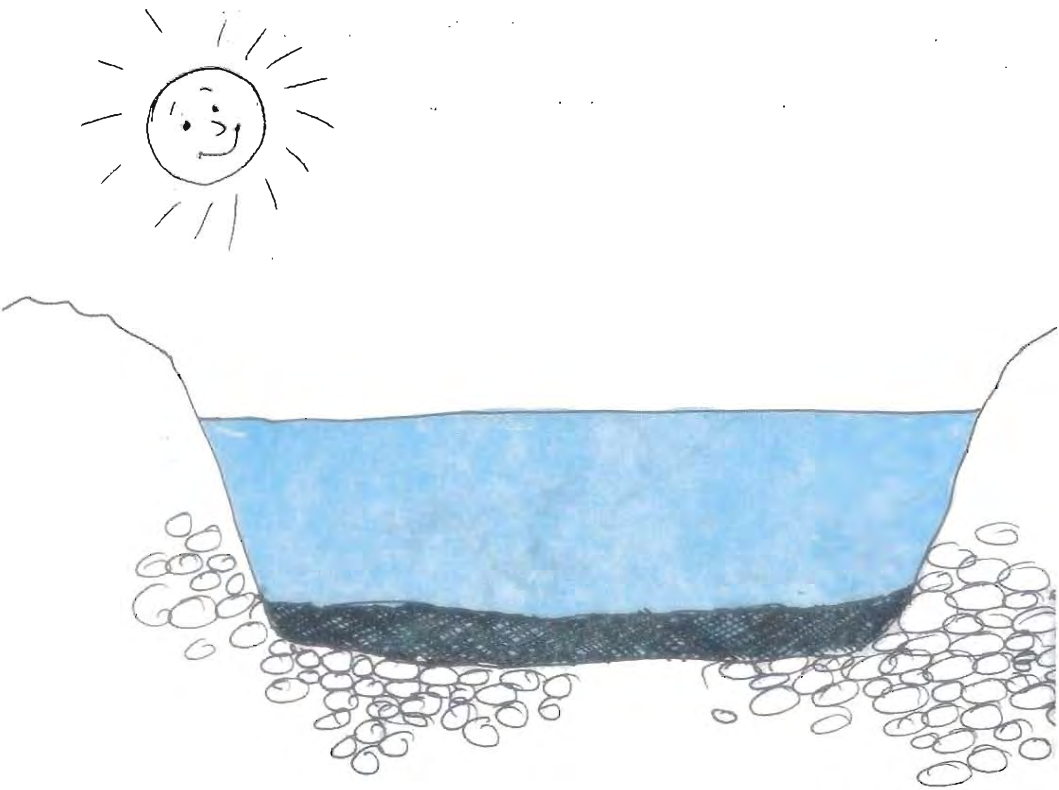


Let us follow our bit of water as it flows on, gathering soil and mud. We will assume that our little stream flows down gullies until it reaches a pond or tank.

You will notice that a tank—or lake, or pond—is always in a little hollow—it is always at a lower level than the land around it.

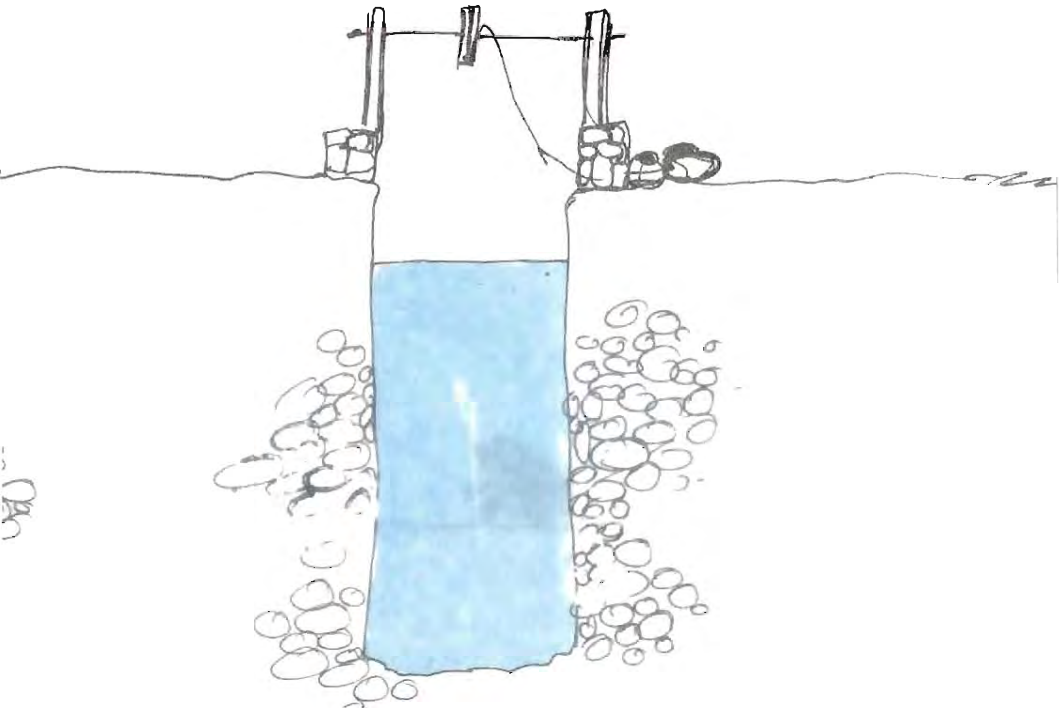
This means that when it rains, the water will flow downwards and collect in the lowest point in the locality, which is the tank. Once it reaches the tank, it will remain there, for the sides of the tank slope upwards, and the water cannot flow up.

But now there will be different kinds of changes and movements. When the sun is strong, some of that tank water will evaporate and become part of the atmosphere; some of it will soak into the bottom of the tank, join underground streams and perhaps come



to rest in somebody's well, thus raising its water level.

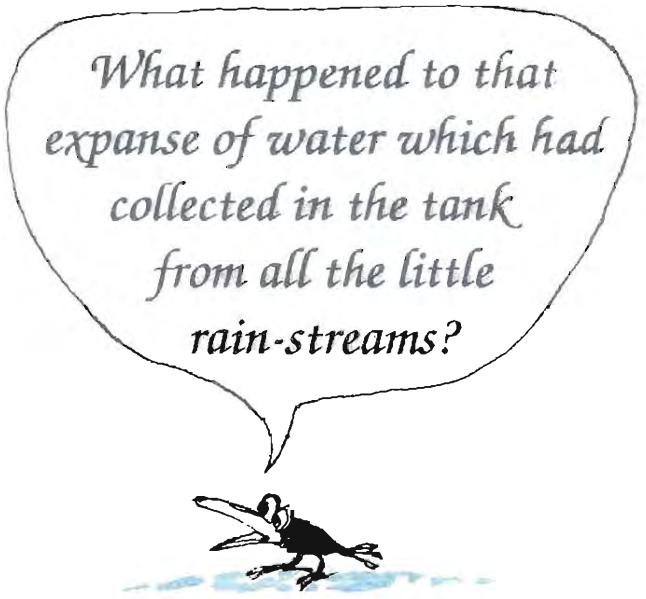
It is lucky to have a well near a tank, because then some of the tank water is going to find its way into your well. However, if the flowing water which reaches the tank is too muddy, it may badly



affect both the tank and your well, and reduce the supply of water.

Let's see how this could happen. Your muddy stream reaches the tank and now stays still. The particles of mud it has brought slowly sink to the bottom and remain on the bed of the tank. In this way the quantity of mud at the bottom of the tank increases, so that the level of the tank bed becomes a little higher every year; and naturally the water has to spread round the sides. So, instead of a good deep tank, your tank becomes shallow and spread-out. The actual area of the water may be greater, but it has become shallower. A very large surface is now exposed to the strong sun, with the result that far more water now evaporates than would from a smaller and deeper tank.

If the monsoon is good, you may see a large body of water by the time it ends. In a few weeks it will have shrunk considerably; in a few months, during the hottest and driest time of the year, when you badly need water, your tank may have become the size of a puddle—or it may have become just a plain piece of flat dry land.



Most of it just dried up before it could be used; it probably did not even reach the neighbouring wells.

The mud which is collected and brought down by streams is called **SILT.** And when a tank becomes shallow because of this extra mud, we say that it has silted up. One of the disadvantages of silt is that it behaves like cement, and can prevent the water from percolating underground from the tank bed. The water is then unable to join underground streams and flow into wells. What a waste of all that precious water. It literally disappeared into thin air, leaving the land around it thirsty, dry and hot.

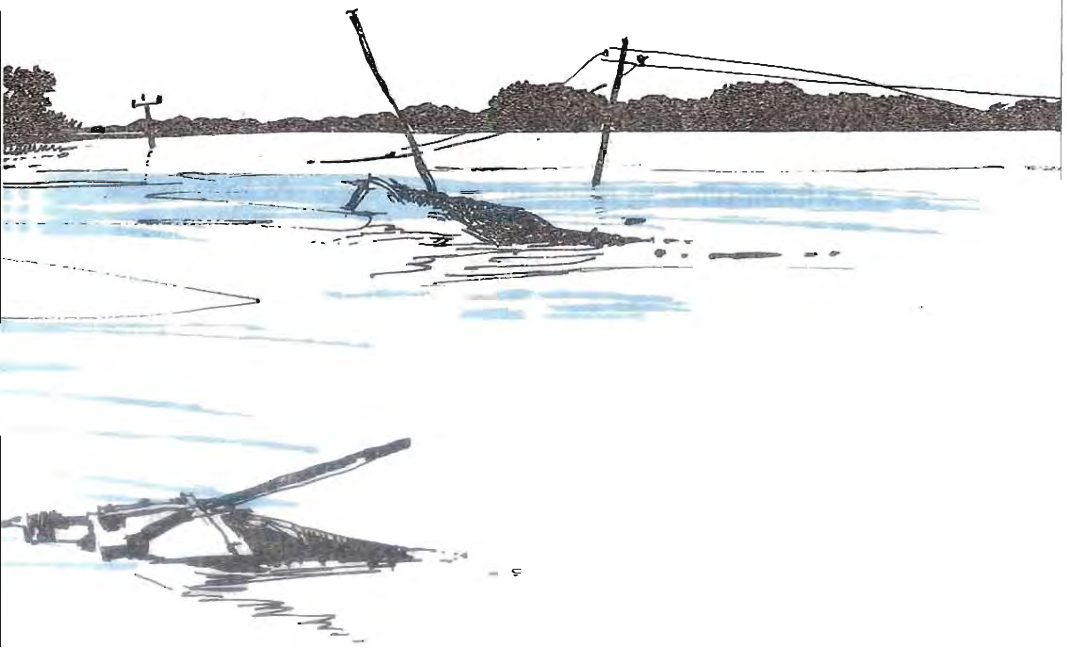
We can now see that the real villain in this story is silt, that is, the fine sand grains so light that they can be carried with a little bit of

water which moves over the land after a shower of rain. If our streams did not bring down silt with them, the tank bed would not have risen so much. The tank would have remained deep and much less spread out; there would have been less evaporation and it would not have dried up. Again, if there had been no silt, the "pores" of the tank bed would have stayed open, and some of the tank water would have percolated into the soil and increased the quantity of what we call ground water—that is, water which "lives" under the soil. This is the water we are looking for when we dig a well.

So now we know that silt is our great enemy, for it prevents

water from getting to the right place with the result that the water is wasted in several different ways. These ways of wastage are unobtrusive and continuous, and often people don't quite understand what's happening—they just know that there simply isn't enough water to wash in, or even to drink. They don't always know quite why this is so, or what they can do to help themselves. The only thing that would help, would be to reduce the amount of silt which is brought into water bodies. Later on we will discuss the ways in which this can be done.

Excess silt has another much more visible and dramatic result, though. It can often result in too much water! In other words, it



may result in floods. You will all have seen pictures where water covers the roads and even gets into houses and shops. People have to take shelter in houses which are built on higher land, or even climb on to the roofs of their own houses, and the army has to drop food parcels for them from helicopters because all the food is drowned. And anyway you couldn't cook because there's no dry firewood or any other fuel.

This usually happens in towns and villages which are situated on the banks of rivers. It happens, of course, when it rains a very great deal in some particular place. The rain could have been in some far-off place, somewhere in the hills, for instance. When the rains are very heavy in hilly places, the water gushes down the hillside in torrents, picking up a lot of silt on the way. If the hillsides are bare, and there are no trees or grass, the silt is ready to slide down the bare slopes even when the rains are not very heavy. Then we have the same story as our tank. The little streams join the big streams, the big streams join the small rivers, and the small rivers join the big rivers, all of them bringing plenty of silt with them. As long as the streams are rushing downhill, the silt is carried along with the water. But once the rivers get to the plains where the land is comparatively flat, the water slows down. In pictures of big rivers as they flow over flat land, the river hardly seems to move. Here the silt gradually sinks to the bottom, to lie on the bed of the river. We saw what happened to our tank bed when a lot of silt was left there. The tank bed became higher, and the water spilled over and covered its sides.

The same thing happens to the big rivers. The river bed, too, is "silted up", the water rises, and spills over the sides. If there are any towns or villages on the sides on the banks, they get flooded. Try to

imagine to yourself what it must be like to be in a town in which there is a couple of feet of water **everywhere.** Where would you sleep, how would you dress, where would you store your food, your clothes, your books? How would you cook, how would you eat? How would you go to school, how would you go *anywhere*?

And yet there are many places in India where this seems to happen nearly every year. Lately it seems to be happening in more and more places. WHY? WHOSE FAULT IS IT? Certainly it is not the fault of the weather-man. Water is the source of life, and

to that extent all water, any water, should be welcome. Most water comes in the form of rain, it is our business to see that this water gets to the right places, where we can use it in the right way.

We can now repeat that the great villain in our environment—the thing that causes too little water as well as too much of it; which makes water collect in the wrong place; which causes drought as well as flood, is the material which we call silt. If only we didn't have any silt, we could have enough water, and water in the right places, where we want it to be.

The problem we have to think about is how to prevent silt from joining any flowing water. So we must stop and think a little.

Wherever there is thick grass on the land over which water is flowing, you will notice two things. You will see that there is much less *flow*—in other words, the water finds it difficult to flow over or between the grass, so it stays in one place, or flows very slowly. This gives it a chance to sink into the land. The other thing you will notice is that even if the slope is steep and it flows quite fast, the water will not be muddy. It will be clear, for the grass is holding the soil in place, and little sand particles, or silt, cannot flow away with the water.

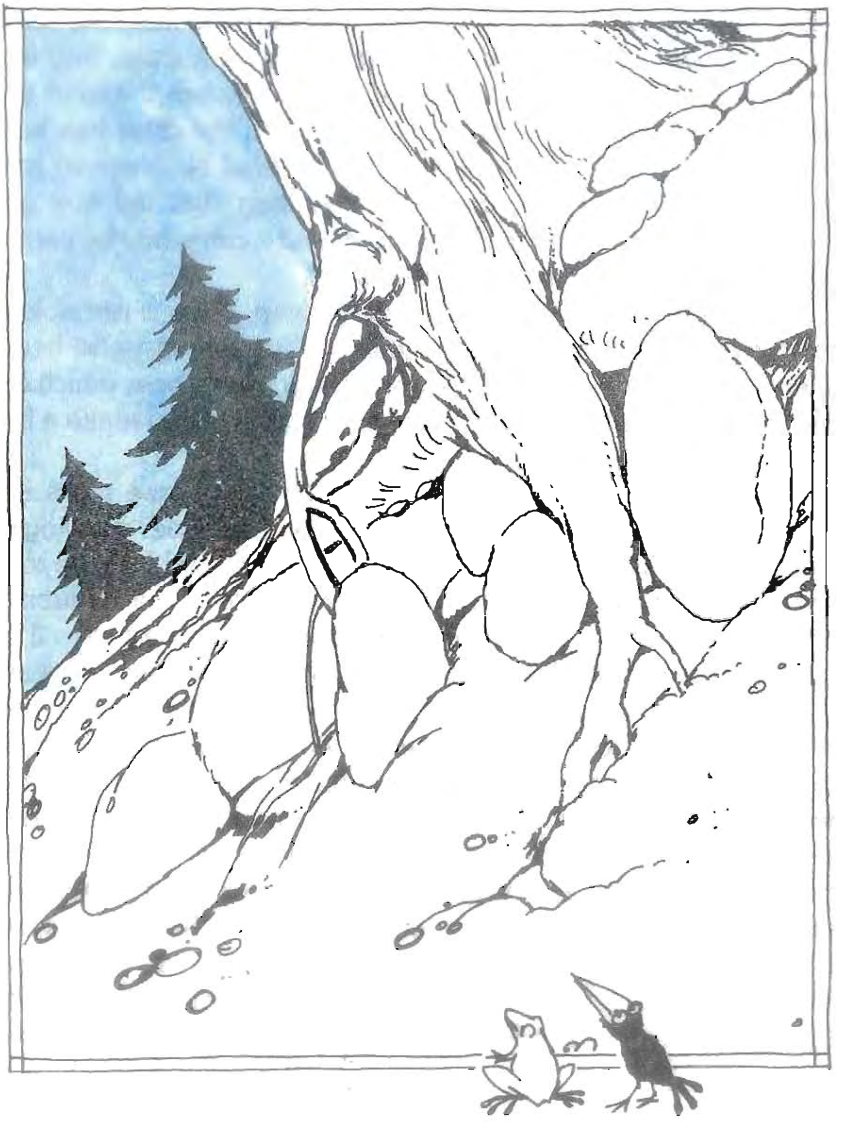
You will see that in a natural environment, the mountain streams are always clear simply because the hillside is covered with grass and trees, and the soil stays in place instead of being carried away by flowing water.

It seems, then that if all our land had grass or trees on it, if only there was no *bare* land, our rivers and lakes would not get silted, the water would percolate into the earth and fill our wells, the rivers would not rise and flood our villages and fields, and we would have fewer droughts as well as floods. Is that right?

Yes. That is exactly right. Our main problem is to keep the soil in place; and any sort of vegetation—grass, bushes, trees, any wild growth would do it. It is when the land is bare, when the trees and bushes have been cut down or dug up, when the grass has been grazed and trampled on by cattle, and the land becomes so hard that new grass cannot come up—it is then that the soil gets displaced, for there is nothing to hold it, and it can easily be carried away by water, and even by the wind.

Sometimes, when the hillside is very steep, grass is not able to take root on it; it is not able to withstand the very fast and heavy water flow after every rain. On such slopes it is only trees which can hold the soil in place for their roots go deep down and make a firm framework to grip the soil.

You will often have seen how very tenacious tree roots are. Often, as you drive or walk on hill roads, you see trees growing on steep banks, where the land has been cut away, and half the roots are exposed. You wonder how the tree can continue to support itself, and you feel sure that one day, quite soon, the tree will fall over. But it does not. Year after year, it continues to stand, firm and upright, in spite of wind, rain and storms. This shows how very strong most tree roots are—for even when nearly half the roots have no soil cover, the other half can hold the tree in place even on the most precarious slopes. Now we can understand that, if there were plenty of trees on a hillside, their roots would make sure that none of the soil managed to get loose and flow away. You will find, then, that in those mountain streams where the hills are covered with trees, in other words, where there is good forest, the water is always clear and clean. No mud can find its way into those streams. Although where the hillside is very steep—almost perpendicular—



you will see that *all* the soil has been either washed or blown away, and there is just bare rock.

What ecologists have discovered is that, where the hillside is gentle, a good cover of grass is enough to hold the soil in place; but where the slope is steep, grass is not enough, even if it could grow there. Only tree roots will work on steep slopes.

Apart from saving the soil, there is another very important job which trees do, and that is, they make it possible for rain water to sink into the soil. You see, when it rains hard, with a strong wind, trees break the force of the raindrops. The rain may lash the tree tops, but after that the water will drip slowly from the leaves on to the earth below. The slow drip from the branches means that each drop percolates into the soil, instead of forming little rivulets and rushing downhill. Once underground, the water helps to nourish the roots of trees; sometimes it reappears above ground in the form of springs, but it always replenishes ground water for the plains below.

Of course, the bigger the leaves, the better it is for the water system, for the water gets a broad surface to break its fall; and if the tree has many branches and many leaves the dripping is even more gradual, and even more effective. Luckily many broad-leaved trees can grow on most of the mountain ranges in India. It is only on the high Himalayan slopes that the climate is so cold that only the needle-leaved pines and firs can stay alive.

We have seen the damage that is done when particles of soil are carried away by water—how rivers and tanks can get silted up and cause floods and droughts. That is of course, a serious matter. But apart from that, we might think that it shouldn't really matter if a little bit of earth is taken away from the top of the land. After all,

there's plenty left—no matter how far down you dig, there is soil, so we needn't really worry about losing a few inches from the top.

Unfortunately, this is not true. If you have ever watched an open well being dug, and you have seen the soil of the lower levels being pulled up, you will know why. That soil is quite different from the soil that we see, the soil in which we grow things in our gardens. The soil at the lower levels is sticky like plasticene, or it is sandy with lots of stony pieces; often its colour is whitish or grey and, somehow, it looks dead. The reason for this is that this soil has never been exposed to the sun and air; it has never been mixed with leaf litter or any kind of vegetable matter which is such an important part of healthy soil. And you will find that hardly any plants will grow in this dead soil. It is only after it has been in the open for a long time that even grass will start growing on it.

It is the "healthy" soil, the "top" soil in which plants can grow. This top soil is very precious, and we would not want to lose any of it, even if there were no danger of it flowing into rivers and causing floods. Indeed, this top soil, nourished by sun, air, broken vegetable and animal matter, is so important to farmers that they make bunds all round their fields in order to prevent their soil from moving away into neighbouring fields.

Most of us begin to understand, quite early in life, that there is a close connection between trees and water. If we see a stretch of bare, sandy or rocky country, with no trees on it, we know, without even thinking about it, that there cannot be much water around. If we see a small group of trees in a desert, we know that it had become an oasis because there was a spring at that spot. And when there is a lush forest or a jungle, we know, again without thinking very hard, that this is an area where it rains quite a lot.

Perhaps we should pause here and think for a while about the different kinds of soil. What do we mean by "top" soil? And then there are loamy, clayey or sandy soils, black cotton soil and dozens of other kinds of soils.

Well, to begin at the beginning, we know that plants take in nourishment through two points: through their leaves and through their roots. By a complicated process, the leaves absorb certain qualities through sunlight, and this, together with the oxygen which they get from the air, is turned into food for the plant. Try putting a plant in a dark cupboard where it gets no sunlight; it will soon starve to death. Another way of starving a plant is to keep its roots away from the soil, so that it cannot feed itself by drawing up food from the soil.

The soil contains minute particles of several kinds of chemicals in various combinations. The roots cannot absorb solid particles, they can only absorb them after they are dissolved in water, which is why a plant needs water as well as soil in order to feed itself. It is the chemicals contained in the soil which are important to the plant, rather than the actual lumps of soil. The lumps of soil are necessary mainly to hold or anchor the plant firmly. Unless it can stay firmly in one position, its roots cannot grow in the direction where they are likely to find water, and therefore food. The roots, you see, have the double function of holding a plant in position and of absorbing food in the form of moisture.

Different kinds of soil have different amounts and combinations of the chemicals that plants need. Scientists tell us that it can take centuries to make one inch of good top soil, while, as you know, a single heavy shower can take it down to the bottom of a lake or stream, unless we make sure that it is held in place by grass or trees. When the top soil goes, we have to use a great deal of artificial nutrients like chemical fertilisers, to make the soil capable of growing what we want.

Scientists also tell us that they have no proof that trees actually draw down rain. They seem fairly sure that there are more rainy, cloudy, cool days in those places where there are a lot of trees. They also tell us that many of the areas which were, once upon a time, covered with trees are now deserts. It is interesting to try and work out how and why this could have happened. Obviously, in every case there must have been slightly different reasons, or combination of reasons, why the trees disappeared, and having

once gone, were unable to come back again. And it is clear that there must have been some connection between the disappearance of trees and the alteration in the climate—although we cannot be sure exactly how and where this connection is.

It is also a puzzle why, once a forest is cut down, especially a dense tropical forest, it does not always grow again even when the land is left alone. Naturalists believe that the main reason for this, in most cases, is that there is just not enough top soil left in those

areas to allow new young trees to take root. There is so much leaf litter on the forest floor of large tropical forests, that this litter itself provides enough "food" for the trees. If a forest is cut down and there are no longer any leaves which can fall, decay and become compost, then the top soil is simply too thin and too poor to sustain young trees. This, you can see, is a very frightening situation. Once you cut down a tropical forest you have lost it for good. It will never grow again.

There are many other ways of losing a forest. It is now believed that one of the major reasons why the once forested lands around the Mediterranean Sea have become bare could be because of goats. All cattle are harmful in forests; cattle trample the soil so that it becomes hard, and new saplings cannot come up. And goats, because they pull away young shoots and saplings by the roots, are the most harmful of all animals. It is said that this is what happened in Greece, which used to be a rich, fertile country. When the number of goats increased, the vegetation died out, and the land became barren. Again, it is a fact that the Rajasthan desert is expanding, it is moving southwards. And finally, ask anyone who

has lived for a long time in Pune, Bangalore or Ranchi. They will tell you that, thirty years ago, the climate was cooler, you never needed a fan, and there used to be light showers almost every afternoon during half the year. They will tell you that all this is changed now, ever since the cities grew bigger and a lot of trees were cut down to make room for buildings. And people who now live in these cities feel hot and need fans; they no longer need coats and cardigans; and, if they have gardens, they have to water them daily. In the old days, when there were plenty of trees and the weather was cool and moist, their plants did not have to be watered every day.

When we talk of trees, we naturally include bushes, grasses, creepers, every kind of plant—which together make up a plant community. Many of the smaller plants can only grow under a big tree, for they need shade; the creepers can only grow if they find something to support them, which again is a tree or a bush. So that when you have a group of different kinds of plants all growing together, they are really helping each other, they are necessary to each other. If you take away one kind of plant, the others are affected—some may even die.

If we wanted to know how all this works, we could try an experiment. We could fence off a piece of land—say one square kilometre and leave it alone for, say, ten years, neither planting anything in it, nor watering it, nor even weeding it. If we kept a careful watch we would see things happening on our piece of land. Probably to start with, a few grasses would come up during the first year's rains. After that various plants would start appearing. The pace would grow faster, there would be small tree saplings, growing because some seeds had blown in from neighbouring

areas. As the grasses grew and produced seeds, the seed-eating birds like larks and pipits would start coming in to feed on the seeds. Other birds would come in to catch insects and worms. Some of the plants which had grown in the enclosure might bear berries; this would bring in bulbuls, orioles and barbets. Some plants might have flowers, and these would bring in sunbirds and flowerpeckers probing for nectar. All these activities lead to more growth and more activities—for the birds would drop seeds which would lead to more plants and more growth. Small animals like squirrels and hare would move in. Your little one kilometre piece of land would become a dense, healthy forest. It would be cooler and moister inside it than outside. And the plot would be continuously changing and growing as each animal and plant affected other animals and plants, sometimes for the better, sometimes for worse. There would be a moving, shifting relationship between everything in your little forest; each thing would help to control others and would in turn be controlled by others. The forest would now have become what naturalists call an eco-system.

PART TWO ◇ WE NEED TREES

A tree is such a familiar thing for all of us that we never stop to think about what a wonderful thing it is, how much it does for us, and, in fact, could we live at all if there were no trees around us?

As far as we humans are concerned, trees and plants give us almost everything we need. They give us our food, of course. Even non-vegetarians could not get their meat if there were no grasses and other plants for the animals to feed on. You would think that fish do not need plants, but actually they too are ultimately dependent on plankton, which is a sort of sea-plant. All right, so we get *all* our food from plants.

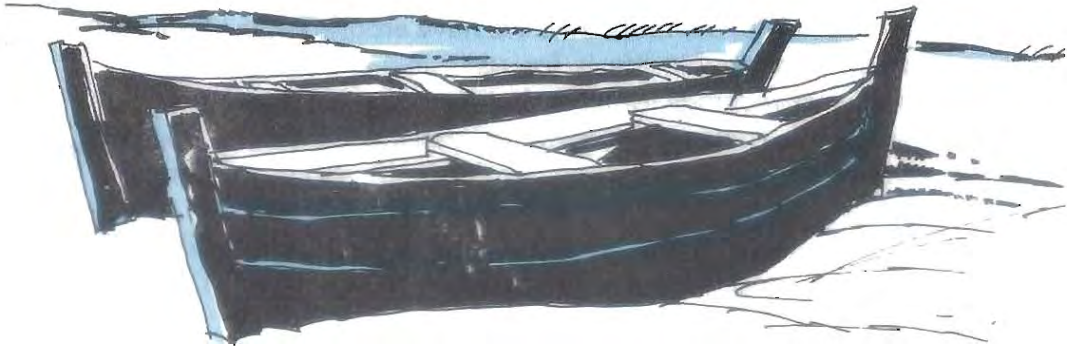
Until a few years ago, we used to get our houses and boats from wood. Only those very few who lived in places where there were absolutely no trees had to use animal skins and hides to make themselves shelters. Otherwise none of our houses could be built without wood. Even stone and mortar houses needed wooden beams and wooden doors and shutters. Village huts were made entirely of materials taken from nearby trees and plants—even the roof was made from palm leaves or grass.

The cotton plant used to provide us with clothing, while, between them, the other plants gave us our furniture and other necessities. Bullock-carts, ploughs, water wheels for wells, even the supports for lining wells—were all of wood. Not even the railways could run without wooden sleepers. Our food was cooked on wood, our houses were heated, when they needed to be heated, by wood fires.

When our houses needed to be kept cool, then too, we used reed curtains to keep out the sun and glare. Indeed, wherever there were plenty of trees and the land was fertile, a community could live in dignity and comfort.

Every tree, every kind of wood, had its own qualities, and was used for special things. In our country, the best wood was that which was hard and dense, so that white ants could not destroy it.

This usually meant slow-growing trees like teak and rosewood. The straight tall trunks of casuarinas were used for the masts of sailing boats; the tough, but often irregular wood of the babool was used for wells and the handles of agricultural tools. Whenever and wherever we needed wood, we could get it from some nearby tree whose wood was specially suited for that particular need.



We have made such free use of wood, and with the gigantic growth of our population we have cut down trees so fast, that, for the first time in our history, we find ourselves short of wood. We have had to find or invent new materials. We have to use cement to build our houses, and use steel and plastic materials. Wood has become so precious that we use all the scrapings, pack them tightly together to make thin sheets of hard-board, which we then use for furniture.

The feel of good wood has become a luxury—only the very rich can afford it now, whereas a few years ago wood was the most natural, cheapest and most easily available material. We have simply used up too many trees, and have not taken the trouble to replace them. We have cut down some trees; others we have allowed to be eaten up while they were still young by goats and cattle; in some cases we have allowed cattle to trample the land so much, that seeds cannot germinate there any more. Just as we have used up too much ground water, without giving the land the chance to absorb and retain more water, so we have done with wood; we do not give the earth the chance to give us more wood.

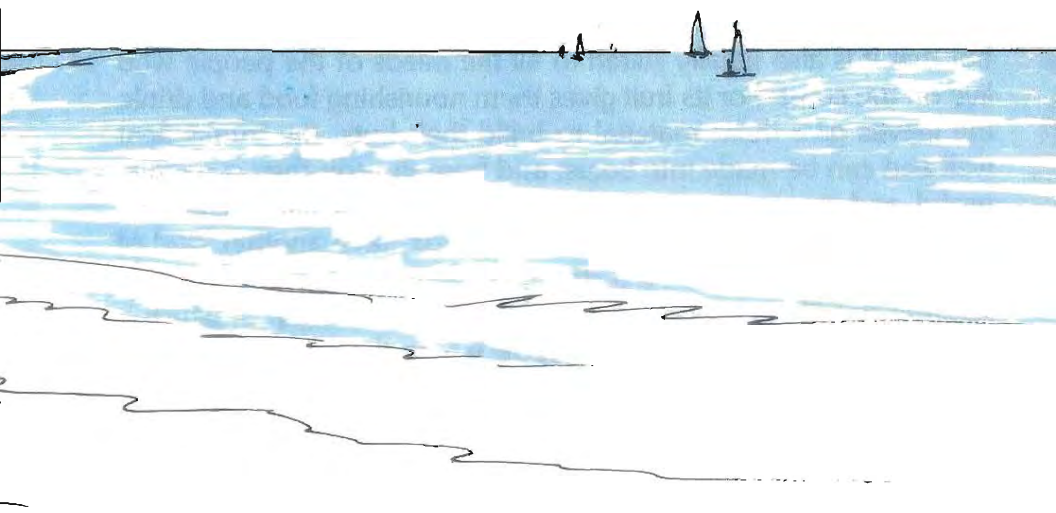
We know how necessary trees and plants are for human beings. We know that we humans could not exist if plants did not exist, too. We know that the more trees we have around us, the healthier and more comfortable life is for us.

What we sometimes forget is that trees are necessary even for the earth itself. They are necessary to keep the soil healthy, to keep the waters clean, to keep the air fresh; in short, to keep the non-living materials of the earth in good condition.

There are thousands of little spaces on this earth, each of which have a very special set of conditions—which have a certain


combination of temperature, a special kind of soil, rock, water conditions, and so on. The kind of trees which will grow in one set of conditions may not grow in a different set. We all know that apples will not grow in Bombay and coconuts will not grow in the Himalayas. Some trees will grow in a comparatively wide range of climates and conditions—like mangoes—while some will grow only within a very narrow range.

Over thousands of years, some plants have evolved to suit



certain particular conditions—until they have become so much a part of the landscape, that one cannot imagine that part of the earth without them.

The most obvious example of this is a piece of sandy tropical coastline and the coconut tree. The coconut tree has become part of the picture of sandy beaches in most of our coastal areas. The seashore is the natural "home" of the coconut palm. When a coconut becomes ripe and mature, it may fall off, and may be carried into the sea by a high tide. By floating along with the current, it may find itself on some new shore, and here the nut, which has not lost its "life-force" may take root and grow into a tree. It is thought that this is how so many of the world's tropical beaches have become fringed with coconut palms. It is interesting that, while coconut trees *may* be grown quite far inland, they generally grow there only when they are deliberately cultivated; they do not grow as they grow on beaches, unaided by man.

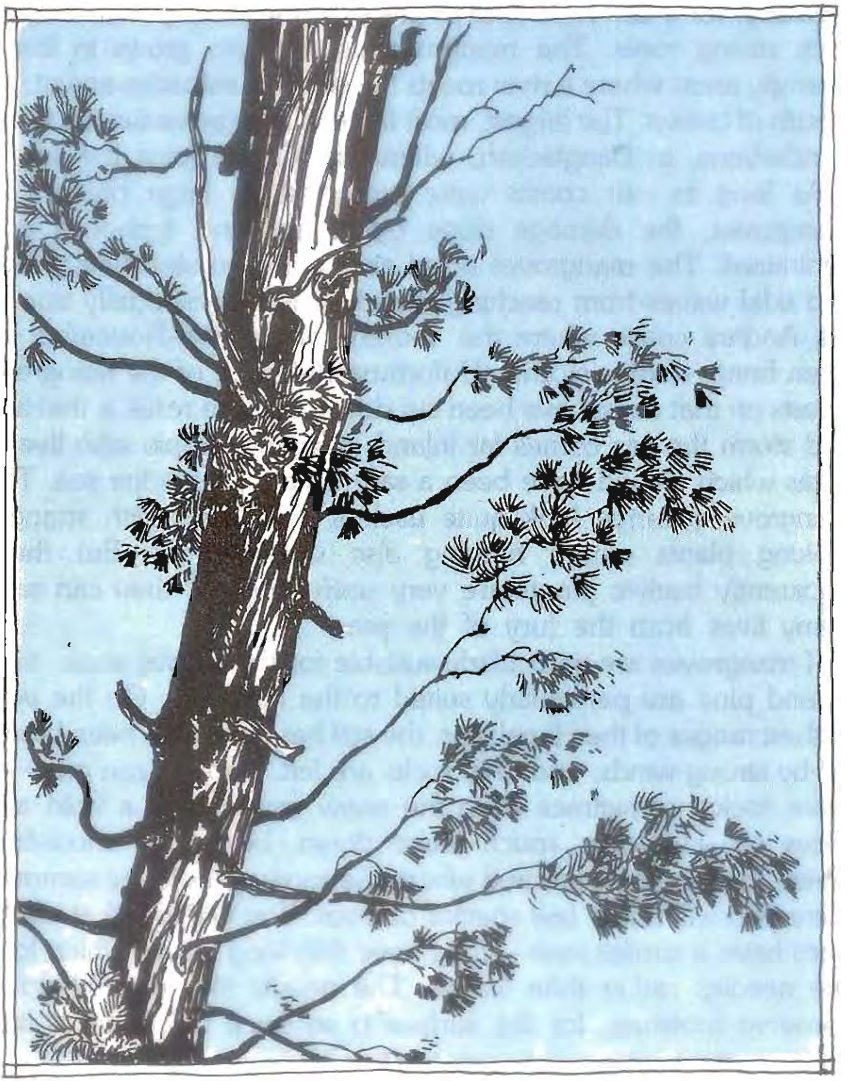
As you watch a coconut palm as it leans into the salty winds which pass through its hinged crown without damaging it, its roots helping to hold the loose sand in place, you begin to believe not only that the tree is ideally suited to survive in that environment, but that it is also ideally suited to fill the needs of the people who live on the coast. For its fruit gives them nourishing food and drink; the leaves give them material to build their huts, the trunks float well and can be made into boats; and from the coir they can make useful and necessary things like ropes, brooms and coverings.

Apart from the coconut, the coastal areas have another kind of guardian. The mangrove is a strange looking plant, with roots that seem to rise like a tripod far out of the mud and slush in which it grows. It is perfectly designed to grow where the tides rise and fall

regularly, for it can hold itself in place in the slithery mud with its thick strong roots. The mangrove usually also grows in those swampy areas where a river meets the sea—in estuaries and at the mouth of creeks. The largest, most famous mangrove swamp is the Sunderbans, in Bangladesh, where the Ganga joins the sea.

As long as our coasts were protected by large patches of mangroves, the damage done by storms and typhoons was minimized. The mangroves acted as a buffer to stop heavy seas and tidal waves from reaching inland. This was especially true of the Andhra coast, where the months of October-November so often bring terrible storms. Unfortunately much of the mangrove forests on that coast have been cut down, and the result is that in a bad storm the sea comes far inland, affecting people who live in areas which should have been a safe distance from the sea. The mangrove swamps *look* quite useless, just areas with strange-looking plants where nothing else would grow. But these apparently useless plants are very useful indeed, they can save many lives from the fury of the seas.

If mangroves are particularly suitable for the coastal areas, then fir and pine are particularly suited to the high hills. On the very highest ranges of the Himalayas, the soil has long since been blown off by strong winds, and only rocks are left. Nothing can grow on these rocks, sometimes even the snow cannot find a hold and slides off. However, much lower down, below the snow-line, where there is some soil and where the snow melts in the summer, there you will find a few species of trees. You will find that all the trees have a similar look—they have thin long leaves which look like needles rather than leaves. The needle like leaves help to conserve moisture, for the surface is so small that there is little



transpiration, unlike in broad leaved species. You will find the trees always green, even when their branches are covered with snow, for the needles last for 3-4 years. Like all trees, these evergreens too, help to hold the soil in place, so that when the snow melts and hundreds of little rivulets run downhill to join bigger streams, the water is clear; the soil is not being washed away with the water.

We have already noted that, once a piece of land has become bare and treeless, it is difficult to persuade any tree to grow there. If the climate is hot and dry, the only thing that will grow is thorny cactus and agave-like plants. These plants are adapted to dry, hot conditions, for their fleshy leaves can store a lot of moisture, enabling them to live on very little water.

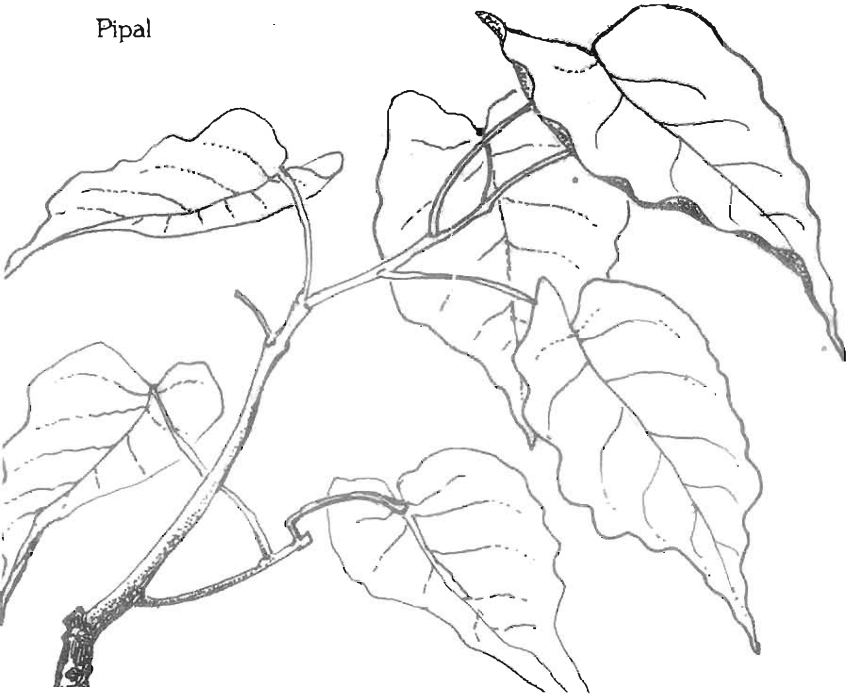
These are some of the major kinds of environments to which plants have adapted themselves. There are however, thousands of sub-environments, each with its own very special type of conditions. But there is such a thing as a general, overall Indian plains environment—the hot dusty plains where it rains only during the monsoon months. And there are some trees which we think of as specially belonging to India. These are the trees which have lived and bred on this soil and in this climate for many many centuries. They belong not only to the land; they have a close relationship with our birds, insects, animals and, above all, with our people. We are thinking of trees like the banyan, the pipal, the neem, the imli, and the mango, among others.

All these are trees which you will find growing in most parts of India, and they are all trees which give much to the people who live close to them. There is no need to describe the banyan. It is our biggest tree, for it goes on adding to itself. Some of its "branches" grow downwards and insert themselves into the soil, adding an

extra "trunk" to the main tree. In good conditions, the tree can live for hundreds of years, for as one part of it dies, another part is young and fresh. The entire tree becomes a home for many kinds of birds and animals, for its figs are a very attractive source of food for them. The enormous crown and spread shelters many species of animals and insects, which makes it a little world in itself. All in all, if there was one tree which had to be chosen to represent India, there is no doubt that that tree should be the banyan.

A close relation of the banyan is the pipal. It cannot compete in size with the banyan, for it has only one trunk but apart from that, it does grow as big as a tree can. Perhaps the most beautiful part of

Pipal



the pipal are its leaves. In February-March the new leaves are an unbelievable translucent pinky copper colour, dancing with every breeze. After they become wholly green, the leaves continue to dance—turning, fluttering and shimmering even when there is no breeze. It is difficult to know what makes the pipal leaves so joyously active—is it something to do with the very long thin point at the end? Or is it something to do with the texture—the close net-like pattern of fine veins, so clearly seen when the leaf is dry. The pipal, as we all know, is considered sacred by Hindus as well as Buddhists, and this fact is reflected in its scientific name, *ficus religiosa*.

Neem

A close associate of the pipal is the neem. I call it an associate because the two trees are often planted together, especially near temples and places of worship. If the pipal is supposed to be spiritually beneficial to man, the neem is believed to be physically beneficial. People use the leaves, seeds, wood, bark, berries, and green twigs for various medicinal and hygienic purposes. Indeed, even the shade of a neem is supposed to be cooler and more soothing than the shade of other trees.

The shade of an imli, too, is cool and deep, for although the leaves are composed of small leaflets, there is tier upon tier, which very effectively counters the heat and glare of the sun. There is no need to describe the delicious fruit of the imli. Every Indian child has known the delight of picking it up from under trees, and sucking it; and every Indian kitchen keeps a little stock of well-cleaned and salted imli—whose flavour makes even the simplest food delicious.

Our finest fruit tree—and perhaps the finest fruit tree in the world—is the mango. There is no need to describe it, except to say that the fruit is so delicious that we sometimes forget that it is extremely nutritious as well. The mango needs no looking after, once it has taken root; it will grow in almost any part of India except the high hills and the real desert.

All of us who have mangoes during the season should make a point of saving at least one stone and planting a tree in some place where it will be allowed to grow, to fruit, and give delight and nourishment to some passer-by.

There are many other trees which have become part of our life and culture. Often the way of life of a region depends on their local tree varieties. In some cases the bamboo may dictate a whole life-style, in some cases the coconut—or the supari palm.

The really good timber trees like teak and rosewood grow in forests and are managed by the Forest Department. Because they are slow-growing, these fine trees are sometimes neglected, and fast growing species like eucalyptus are planted instead.

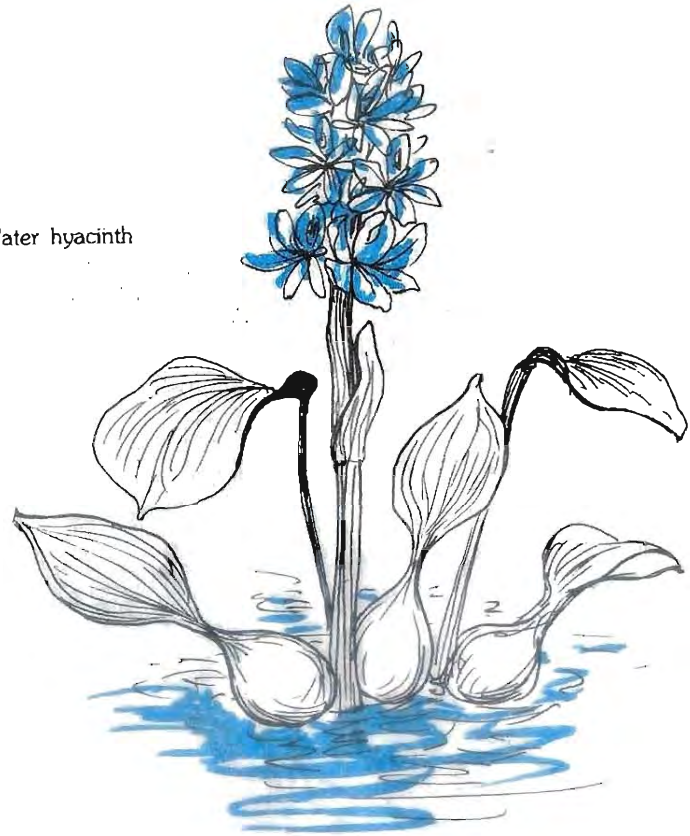
The eucalyptus is not an Indian tree, it came from Australia, and most conservationists dislike it intensely. They are convinced that the large tracts of eucalyptus, planted for quick profit, are doing a great deal of harm to the soil as well as the water regime. The eucalyptus leaf is hard and leathery and does not disintegrate to form humus, like most other leaves; while the roots of the eucalyptus are said to be over-efficient, drawing up so much water from the soil that they not only deprive neighbouring trees but also drain the land of its subsoil water.

The eucalyptus, in short is an exotic—it is like a foreign conqueror who has not been able to merge into the land which it has conquered. It lives on our soil, water, and sun but it gives back little in return—neither food for our animals, nor food for our land. Naturalists dislike it because they say that it is only useful to industrialists who want the wood for turning into paper or fibre.

Some of the other exotic, or foreign, plants have settled down well in India, that is, they are now a part of our web of life—they contribute to enriching the soil, and they also provide food of some kind—whether it is food for human beings or food and living space for animals or birds or insects. Many of our bright flowering trees, like the gulmohur, the several cassias, and several others, are now

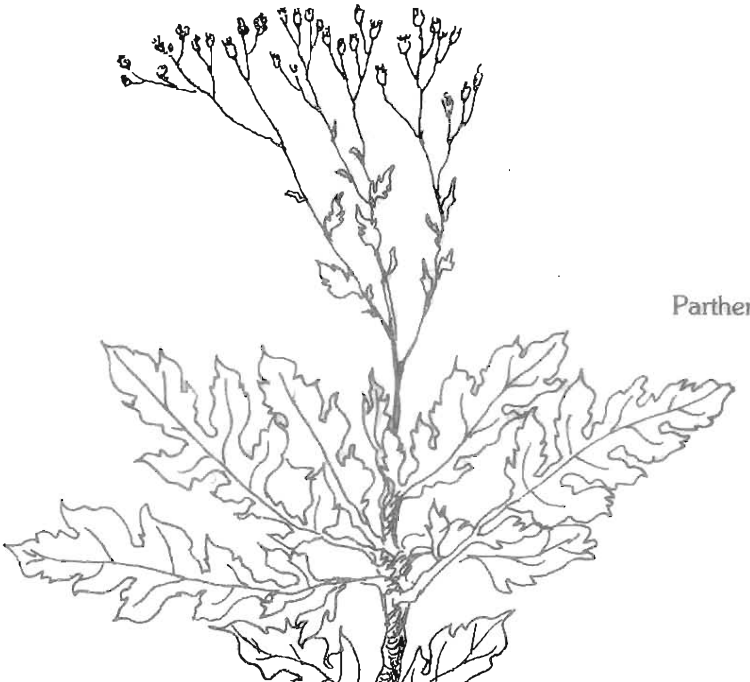
considered as good as natives. We have no complaints against them—they have been here for many years, and have become part of our landscape. But there are some other exotic plants which have come into the country by mistake, as it were, and which are doing a great deal of damage to our land and water systems.

When an exotic plant arrives in a new land, it sometimes finds



Water hyacinth

that conditions are too difficult for it—perhaps the heat, lack of moisture, or any other condition—so that it cannot survive. But sometimes the opposite happens; that is, the conditions are too favourable and it multiplies too fast. There is always a great deal of give and take between different forms of life—some animals eat other animals, while they themselves are in turn eaten by bigger



Parthenium

animals. This sort of interaction takes place between plants, animals, birds and insects all the time. Thus, in the case of every plant, there are some insects which keep it in check, which prevent it from spreading too fast at the expense of other plants. Well, in the case of a few foreign plants which came to India, they came without their enemy insects, which had kept them in check in their native lands. There are now three such exotic plants here which are multiplying very fast and causing great havoc, because they have no enemies to keep them under control.

The first of these is the water hyacinth. This is a small mauve-flowered plant which is now covering many of our tanks and ponds. This plant is really dangerous because if a single plant gets into a tank, it will soon cover the entire surface, and its rate of transpiration is so fast, that it will suck up all the water, turning the pool into dry land. You can imagine the calamity which would face us if all our water bodies dried up—because of the water hyacinth.

The second worst exotic is the parthenium. This has a cluster of white-capped flowers, which has earned it the name of Congress weed. It is a late arrival, and has all the worst qualities of an exotic. Again, without any "enemy" it has spread all over many towns and cities. The parthenium displaces our native grasses on which our cattle used to graze. And since our cattle seem to dislike parthenium, they are left with very little food. If the parthenium affects the food supply of cattle, it also affects the health of the human population. It is said to be the cause of asthma and other kinds of allergies among the people who have to live close to it.

The third exotic pest is usually found in forests and jungles. Wherever trees have been cut, and there is a little open space, into this open space the eupatorium inserts itself—a loose, sprawling

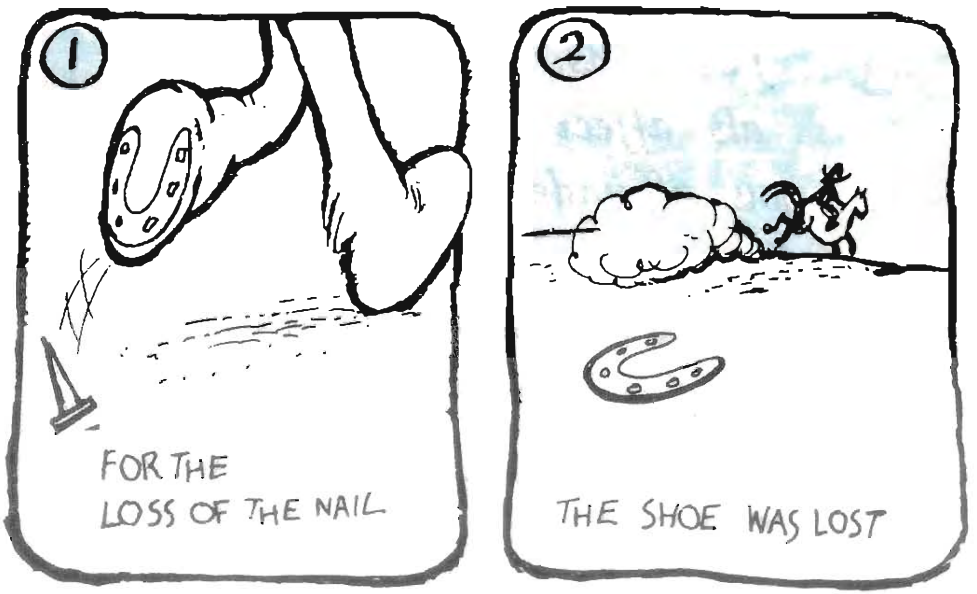
shrub which, like the parthenium, cannot be eaten by animals—in this case wild animals—but crowds out good plants which would play their part in feeding the animals and keeping the forest healthy.

These three plants are doing enormous harm to our country. Can you imagine any greater harm than reducing the quantity of our water, or depriving our animals of food? Unless we can check the spread of these weeds quickly, our country could soon become a desert.

Having seen the many ways in which water affects vegetation and soil, soil affects vegetation, vegetation affects soil, and the climate affects all three plus animals as well; how birds, insects and animals also affect vegetation and soil, you will understand why all nature has been likened to a vast and very intricate jigsaw puzzle.

If everything goes well, all the pieces should fit tightly into each other. If even one piece is out of place, the whole picture is disturbed and incomplete. No unit, whether bird, animal or vegetation, is complete in itself; it depends for its well-being on other units; and in turn, it is depended on by others.

One small disturbance then can throw out a whole chain of events. Do you remember the saying about the horse-shoe nail which was lost? "For the loss of the nail, the shoe was lost; for the




3
FOR THE LOSS OF THE SHOE THE HORSE WAS LOST

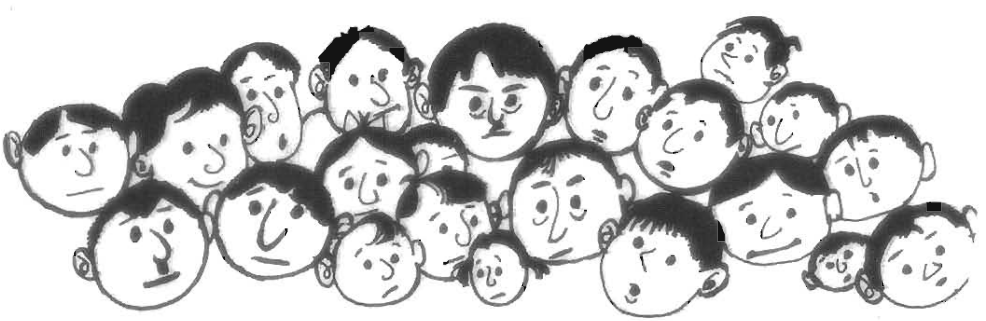

4
FOR THE LOSS OF THE HORSE, THE GENERAL WAS LOST


5 FOR THE LOSS OF THE GENERAL, THE BATTLE WAS LOST. AND ALL FOR THE LOSS OF A HORSE-SHOE NAIL.

loss of the shoe, the horse was lost; for the loss of the horse, the General was lost; for the loss of the General, the battle was lost. And all for the loss of a horse-shoe nail." In nature, too, the chain of events is long and complicated. And the fact, which we sometimes forget, is that we humans are also a part of nature. We might live in tall cement buildings, we might travel in cars and aeroplanes, we might wear nylon clothes and use computers, but we cannot live without food, water and air. And if we do not get enough water because we allow it all to run off into the sea; if we cannot have food because our top soil has been carried away so no plants or grass will grow; and our air is so filthy with car and other fumes that we cannot breathe it—then we will find that all our computers and VCRs will not help us to survive, let alone enjoy life.

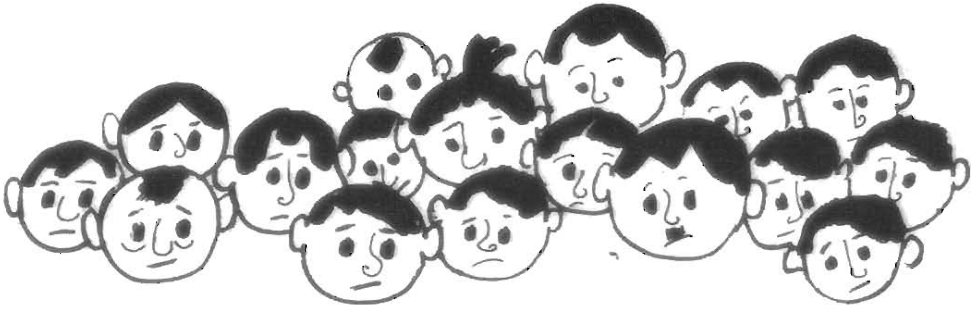
If you are sitting in your room, reading this book, try an experiment. Think of something you use every day, all the time, and trace it back to its origins. For instance, let's imagine you think of your shoes or chappals, which you wear every day. They are made of leather. Where did the leather come from? From cattle. How are cattle raised? They are raised on grass. Or, you are reading a book. Where did the paper come from? It was made from grasses and soft woods. Your school bag is made of canvas. Canvas is made from cotton fibre; and cotton needs good soil to grow in. You are sitting at a desk; where did its wood come from? You are eating a chocolate; where did the cocoa come from? And the milk in it? And the butter? You will see that whatever we use in everyday life is seldom more than a few steps removed from some natural life form. So that if something goes wrong with any part of natural life, we would feel it, and our own life would become uncomfortable because of it.

If we look back to a hundred years ago, or even fifty years ago, we'll find that there was very little talk about the state of the environment. People did not feel that they needed to think about it, leave alone worry about it. The earth had been providing everything we needed for thousands upon thousands of years. Except in small patches for short times, it had never failed to give



people enough food, shelter, good water, and clean air. In fact, it was only just over a hundred years ago that some people began to realize that there could be such a thing as dirty air, and that it could harm us just to breathe that air. All our environmental problems have come upon us very recently. How and why did this happen?

There are, broadly, two main reasons why our earth has, in the



past century, become more unliveable than it has ever been before; and both the reasons are the result of what we have so far called "progress". The first reason is the result of all the mechanical and technical inventions like cars, aeroplanes and factories, which make extraordinary demands on our natural resources, and discharge dirt into the air. Just think of the amount of oil and petrol used by all the cars and aeroplanes and in the factories of the world, and think of the filthy smoke they add to the air around us.

The second reason for our environmental troubles is even more paradoxical. It is because our medical research has been so successful that most people now live much longer than they ever did before. In the days before our doctors knew so much about medicine, very few people lived to be really old, for there were many diseases which had no cure. Now that there are cures for so many sicknesses, a great many people live on to a very old age. You can see that if, instead of dying at the age of fifty, people live on until they are nearly eighty years old, then at any one time there would be a great many people alive all needing vegetation for food, wood for shelter and furniture, water to wash and drink, and many other basic necessities. In 1947, our population was about 350 million; today it is about 800 million. This is not because more babies are being born now, but because fewer people are dying early.

However much we try, we are not going to be able to increase the quantity of our food and other goods beyond a limit. So the only way we can survive is to try and make sure that our population does not increase any more—in fact, to try even to reduce our numbers. As our numbers have grown, we find that our troubles are not connected only with material things like food. We

find that our schools are over-crowded, we do not have enough teachers, there is no room in our colleges, our trains and buses are over-full, our roads are so crowded that we can hardly use them, we cannot get a house to live in, we cannot go on a holiday because there are too many people who want to do the same thing. You will find that too many people competing for the same things—in this case, for space—makes everyone tense and bad tempered. No wonder there are always riots and violence—everyone is under pressure and ready for a fight, and the smallest excuse is enough to start one.

Apart from houses, schools and other such things, one of the major shortages is jobs. There are simply not enough jobs for the number of people who want them. Again the result is that young people, with no work and nothing to do, are tempted to steal and cheat, to commit burglaries, often to kill. We can see that if we had managed to keep our population to the size it was in 1947, we would have been better off in almost every way.

From now on, whenever you see some major, or even minor problem, which affects our country, try to trace it to its origin, and ask yourself why this should happen. I think you will often find the root cause is something to do with the environment; and remember, our swelling population is the major reason for our worsening environment.

It may often happen that you cannot really understand the cause of certain problems in the natural world. Why is there now a water shortage in our town? Why does our local tank dry up every year when my father says it was always full in his young days? My father also says that floods were rare events when he was young. Why are they now so common? It may be difficult to understand the reasons

for such things, but if you think back carefully, tracing the connection between soil, and water and greenery, I think that you will come to the conclusion that the basic cause is the lack of trees, and that if there were enough trees such things would not have happened.

Perhaps in a way, it is not really necessary to wait and look for the causes of environmental disasters. In fact without even waiting for any particular disaster, it is a good idea to just keep planting trees—whenever and wherever you can.


If the world
is to be saved,
it will be
saved by
TREES !

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